

NOTES ON CERTAIN SPECIES OF MELANOSTOMA

(DIPTERA; SYRPHIDAE)¹

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The following paper is an attempt to deal with the commoner North American species of *Melanostoma* wherein the facial ground color is obscured by whitish pollen, more or less in ripple-like formation, and the abdomen is banded with metallic fasciae.

The writer has placed Bigot's *M. rostratum* as a variety of the common *obscurum* Say of the Eastern States. From the description *M. pictipes* Bigot is not with certainty applicable to any species known to him.

Three of the species, *stegnum* Say, *obscurum* Say var. *rostratum* and *chaetopoda* new species were bred from the ovum, the larvae feeding on aphids and transforming much in the same manner as contemporaneous larvae of species known to be normally aphidophagous (*Eupcodes volueris* Osten Sacken, *Allograpta obliqua* Say, etc.). Whether or not *Melanostoma* larvae are normally aphidophagous appears still in doubt; it is certain that field collections of larvae associated with aphids are very rare, when the abundance of the adult flies is taken into consideration.

In the laboratory, however, the larvae are easily reared on an aphid diet, while gravid females, collected in the field, deposit ova in cages about as readily as species of *Syrphus*, *Eupcodes* or *Allograpta*.

Acknowledgment is due to Mr. C. Howard Curran, Vineland, Ontario, for the type material of *Melanostoma ontario* new species for other material used in the preparation of this paper, and also for helpful suggestions.

Melanostoma chaetopoda new species (Text-fig. A.)

Male. Antennae oval, third joint twice as long as wide; brownish black, lighter below; arista black. Vertex and frontal triangle shining bluish-black; pile black, of moderate length. Face with whitish punctate pollen, a median shining black stripe not reaching the antennae, facial pile white; breadth

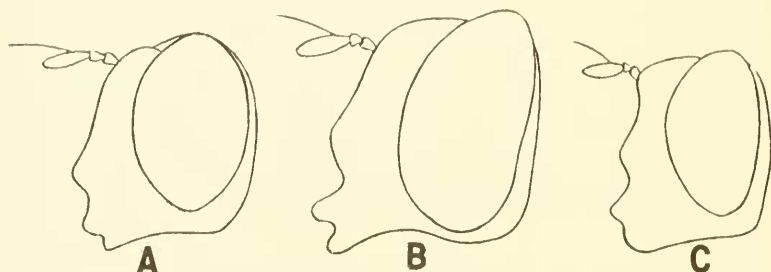
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of the face between the eyes below greater than the distance between the antennae and the mouth edge. Cheeks shining black, gray pollinose, white pilose; profile of face almost perpendicular below antennae, receding below the obtuse facial knob. Eyes red, bare. Occiput silvery pollinose, pile white beneath, dark above.

Thorax and scutellum shining bluish-black, pile light gray; at apex of scutellum a few longer blackish hairs. Wings exceeding abdomen in length, hyaline, stigma light amber. Halteres dull grayish white. Tegulae dull white, fringe fulvous. Legs black, knees yellow, front and middle tibiae and tarsi testaceous; front tibiae with a row of six long and rather stout black bristles, middle tibiae with four similar, but slenderer bristles; pile elsewhere on legs mostly whitish; pile on the sides of the thorax white.

First segment of the abdomen shining bronze. Second segment opaque black, on each side at the margin an elongate shining spot. Third segment opaque black, two narrowly interrupted rhomboidal shining bronze spots, extending from the anterior margins two-thirds of the length of the segment. Fourth segment similar to the preceding, but the bronze spots do not extend beyond the middle of the segment and the posterior border is narrowly shining bronze. Fifth segment and venter shining bronze. Hypopygium shining black. Abdominal pile white.

Length, 7 to 8.5 mm.



Text-figures. A.—*Melanostoma chactopoda* new species; profile of head of female (outline). B.—*Melanostoma obscurum* var. *rostratum* Bigot; profile of head of male (outline). C.—*Melanostoma ontario* new species; profile of head of male (outline).

This species may be recognized by the broad face which recedes below and is almost perpendicular in profile, by the black facial stripe and by the thickened bristles of the front tibiae.

Described from six specimens collected in the vicinity of Alhambra, California, and from two individuals reared from the egg at Alhambra, 1919 and 1920.

Female. Antennae oval, brownish black, distal joint at base below yellowish red. Vertex shining black with black pile. Face with whitish punctate pollen below antennae, a shining black median stripe not reaching the antennae. Cheeks shining black, grayish pollinose, white pilose. In profile the face

is slightly concave below the antennae, the facial knob protrudes beyond the antennal tubercle, below the knob the face recedes. Eyes bare. Occiput silvery pollinose, white pilose.

Thorax and scutellum shining bluish-black, pile white. Wings exceeding the abdomen, hyaline, stigma light amber. Halteres pale yellow. Tegulae white. Legs testaceous, femora except apices black; hind tibiae with an obscure dark brown ring at apical third; pile of legs whitish.

First abdominal segment shining metallic green. Second segment shining metallic green, posterior border and a median emarginated projection opaque black. Third segment similar to preceding, except that the shining emargination is narrower and reaches deeply into the opaque portion. Fourth segment shining metallic green, with two oblique opaque black spots which touch the margin at the posterior angles of the segment, and do not quite reach the middle of the segment at their anterior ends. Fifth segment shining metallic green. The opaque bands of the second and third segments narrowly reach the lateral margins and in the middle reach beyond the middle of the segment. Pile of abdomen white.

Length, 6.5 to 8 mm.

Described from ten specimens collected in the vicinity of Alhambra, California, and from one specimen reared from the egg at Alhambra, 1920.

Holotype (male) and allotype (female) in the U. S. National Museum.

The female may be recognized from that of other species treated in this paper by the greenish abdominal bands and punctate facial pollen; from *M. stegnum* by the longer facial stripe.

In general this species approaches *M. stegnum* more nearly than any of the others. Both have punctate pollen on the face and the black hairs of the fore tibiae are thickened. In *stegnum* the shining abdominal spots are greenish or greenish-gray in both sexes, in *chaetopoda* those of the male are distinctly bronze. That the two sexes above described under this name belong together has been proved by breeding experiments.

Melanostoma ontario new species (Text-fig. C.)

Male. Antennae brownish black; third joint oval, twice as long as wide, yellowish at the base below; arista bare, black. Vertex black, black pilose. Frontal triangle black, obscurely shining; pile black, of moderate length. Face whitish pollinose, in obscure ripple-like formation; in the middle a bare shining bluish stripe not reaching base of antennae. Profile below antennae shallowly excavated, the facial tubercle protruding slightly beyond the antennal; below this concave, the epistoma protruding equally with the facial tubercle; thus the face is perpendicular in profile. Cheeks shining bluish with scant white pollen, white pilose. Eyes red, bare. Occiput silvery pollinose; pile below white, above fuscous.

Thorax and scutellum shining bluish-gray, pile fulvous; scutellum with a border of longer fuscous hairs; pleura white pilose. Halteres gray. Tegulae white, fringe fulvous. Wings exceeding the body in length, hyaline, stigma dilute yellow. Legs testaceous, femora black except at apices; front and middle tibiae with a narrow fuscous ring, hind tibiae with a broader black ring; tarsi except the basal joint of four anterior legs fuscous; all the tibiae with a row of long slender black hairs, pile on legs elsewhere mostly white.

First abdominal segment shining bronze black. Second segment opaque black, on each side with an elongate shining greenish-gray spot; this spot is produced along the anterior borders and again at the middle of the segment, and is narrowly separated from the posterior border. Third segment opaque black, with two triangular shining greenish-gray spots extending along the anterior border and reaching along the sides two-thirds the length of the segment; an indefinite narrow shining stripe runs down the middle of the segment. Fourth segment shining greenish-gray; on the posterior half two slightly oblique opaque black spots, narrowly separated in the middle and narrowly cut off from the posterior border of the segment; these spots touch the lateral margin just anterior to the posterior angles. Fifth segment shining greenish-gray. Hypopygium shining black, pile of abdomen white, on opaque portions black and white intermixed.

Length, 7.1 mm.

Described from two individuals collected in Ontario, Canada, (C. H. Curran), in 1913.

Female. Antennae brownish-black; third joint yellow below, oval, twice as long as wide; arista fuscous. Vertex shining black, pile black. Face with obscure ripple-like whitish pollen, which extends upward on the side to the vertex; in the middle a black shining stripe not reaching the antennae; pile of the face white. Cheeks shining black, with scant grayish-white pollen, white pilose. In profile the face is shallowly excavated below the antennae, the facial tubercle slightly protruding beyond the antennal tubercle; below the facial tubercle the face recedes. Eyes bare. Occiput white pollinose, white pilose.

Thorax and scutellum shining bluish-gray, pile light yellow; on the border of the scutellum two longer pale hairs. Wings exceeding the abdomen in length, stigma dilute yellow. Halteres dull yellow. Tegulae white, fringe fulvous. Legs testaceous, basal half of front and middle femora, basal two-thirds of hind femora, black; hind tibiae fuscous; hind tarsus and last two joints of four anterior tarsi black.

First abdominal segment shining black. Second segment opaque black with two triangular shining bronze spots, broadly separated, reaching behind almost to the posterior angle of the segment. Third segment opaque black, with an anterior shining bronze fascia, which is produced laterally almost to the posterior angle of the segment. Fourth segment shining bluish gray, in front with two triangular bronze spots; on the posterior half of the segment two slightly oblique opaque black spots narrowly separated and joining the

margin of the segment briefly at the posterior angles. Fifth segment shining gray; on the second and third segments there is a narrow shining median stripe. Pile white, on opaque portions black and white intermixed.

Length, 6.75 mm.

One specimen, Canada which apparently belongs with the two males.

Holotype (male) and allotype (female) in the U. S. National Museum.

This species differs from *M. obscurum* and *M. obscurum* var. *rostratum* in the fact that the head is not produced below beak-like; from *M. chaetopoda* in the abdominal spots of the female being distinctly bronze, and not greenish, and in the pollen of the face of both sexes being non-punctate.

Melanostoma obscurum Say, variety **rostratum** Bigot (Text-fig. B.)

Male. Antennae brownish-black; joint three oval, twice as long as broad, yellow below at the base, sometimes the whole underside yellowish; arista black, bare. Vertical triangle bluish-black, black pilose. Frontal triangle bluish-black, obscurely shining, black pilose. Face grayish pollinose in indistinct ripple-like formation, a median rather narrow shining bluish-black stripe not reaching the antennae; facial pile black above, white below. Cheeks shining black with scant whitish pollen and white pile; facial tubercle protruding considerably beyond antennal tubercle, the epistoma protruding beyond the facial tubercle; giving the face in profile a rostrate appearance; below the antennae gently concave. Eyes red, bare, contiguous, ten facets. Occiput white pollinose, pile white below, fuscous above.

Thorax and scutellum bluish-gray, shining; pile fulvous, scutellar pile long, black and fulvous mixed; on the humeri a tuft of black hairs. Wings equal to or exceeding the body length, hyaline. Halteres dull gray. Tegulae white, fringe fulvous. Legs black, apical third of four anterior femora testaceous; hind knees yellow; anterior tibiae except a broad ring near the apex, whole of middle tibiae, base and apex of hind tibiae, basal joints of all tarsi, testaceous; hind metatarsi slightly incrassate; pile of legs mostly light; all tibiae with a row of about eight long slender black hairs.

First abdominal segment shining bluish-gray. Second segment opaque black along the side with a shining silvery-gray spot, which is produced along the anterior border, again at the middle of the segment, and reaches along the sides three-quarters the length of the segment. Third segment opaque black, with two shining bronze trigonal spots; these spots reach on the lateral margins two-thirds the length of the segment; second and third segments also with a narrow median shining stripe. Fourth segment shining bronze, on its posterior half with two narrowly separated slightly oblique opaque black spots, which reach the margin of the segment just before the posterior angle. Fifth segment shining bronze. Hypopygium shining black. Venter shining purplish-black. Pile of abdomen white, on the opaque areas short black and white intermixed. Sides of the abdomen nearly parallel.

Length, 6.5 to 9 mm.

Described from twenty individuals from Alhambra and Berkeley, California, 1919 and 1920.

Female. Antennae brownish-black; third joint oval, twice as long as broad, yellowish red below; arista dark brown, bare. Vertex shining bluish-black, pile black, above the antennae a band of gray pollen. Face on the sides below grayish pollinose in obscure ripple-like formation, a median shining bare stripe not reaching the antennae. Cheeks shining gray with scant whitish pollen and white pile; pile of the face white below, and black above, the antennae. In profile the face is rostrate, the epistoma projecting beyond the facial tubercle and this in turn projects beyond the antennal tubercle.

Thorax and scutellum shining bluish-gray, pile white, a few longer black hairs on the margin of the scutellum. Wings project slightly beyond the body, hyaline; stigma light amber. Halteres gray. Tegulae white, fringe fulvous. Legs black, apical half of the four anterior femora reddish-brown, hind knees fuscous, anterior and middle tibiae reddish-brown, basal joints of the four anterior tarsi yellowish brown; base and apex of hind tibiae fuscous; pile of the legs mostly white.

First abdominal segment shining grayish-black. Second segment on the sides and anterior margins shining grayish-black, posterior margins opaque black; in the middle of the segments two bronze spots. Third segment opaque black, with two shining orange colored spots narrowly separated from the anterior border. Fourth segment shining grayish with two similar orange spots and with an interrupted opaque black band on the posterior half. Fifth segment shining greenish-gray, the pile of the abdomen white, on the opaque areas black and white intermixed. Abdomen narrowly oval, widest at the apex of the second segment.

Length, 6 to 8.5 mm.

Described from twelve individuals collected and bred at Alhambra, California, 1919 and 1920.

This appears to be the form described by Bigot as *M. rostratum*²; it differs from typical *obscurum* in the facial stripe being narrower, the thorax more of a bluish-black instead of greenish-black, the scutellar hairs longer and more black on the disc as well as at the edge.

This species is very abundant in Southern California in Spring.

Melanostoma trichopus Thomson

In the National Museum collection are several specimens from Alaska which have been identified as this species. In the facial characters, including rostrate epistoma, they closely resemble *M. obscurum* Say and the variety *rostratum* Bigot. The abdomen of the male is narrower than in these two flies, while

² Bigot, Ann. Soc. Ent. France, 1884, p. 80.

the shining spots are distinctly gray and not bronze. In the female these spots are orange, and the abdomen is more oval. Thomson described his species from California.

Key to the Species of Melanostoma described or mentioned above

I

- Pollen of face in obscure ripples, impunctate. 3
- Pollen of face punctate. 2
- 2. Face with a shining black stripe, vertical . . . **chaetopoda** new species
- Face with but the tubercle shining. **stegnum** Say
- 3. Profile of face almost perpendicular, not obviously rostrate.
- ontario** new species
- Profile of face rostrate, the epistoma projecting considerably beyond the facial tubercle 4
- 4. Thorax shining greenish-black, the facial stripe broad . . . **obscurum** Say
- Thorax shining bluish-black or bluish-gray, facial stripe narrow.
- obscurum** Say, var. **rostratum** Bigot

II

- Facial tubercle alone shining **stegnum** Say
- Vertical shining stripe on the face, but not reaching the antennae. . . 2
- 2. Facial profile rostrate, the epistoma projecting considerably beyond the facial tubercle of knob. 3
- Facial profile perpendicular, the epistoma not projecting beyond the facial knob. 4
- 3. Thorax greenish-black, facial stripe broad **obscurum** Say
- Thorax bluish-black or bluish-gray, facial stripe narrow.
- obscurum** Say, var. **rostratum** Bigot
- 4. Facial pollen punctate. **chaetopoda** new species
- Facial pollen in obscure ripple-like formations and impunctate.
- ontario** new species

BIOLOGICAL NOTES

Melanostoma stegnum Say (Pl. I, fig. D.)

A gravid female was collected in the field at Alhambra, California, on March 11, 1920, and transferred to a chimney cage enclosing a young broad bean plant infested with *Aphis rumicis* Linnaeus. The fly was fed with sugar water and died March 20, after having deposited ninety-seven ova on the foliage. These ova in many cases were ranked side by side or end to end, but a few were laid singly. The ovum is cylindrical, elongate, rather sharply tapering at each, more so at the non-micropylar end; white, not chalky; chorion sculptured with regular hexagonal markings, small and not elevated; size of ovum .88 mm. \times .32 mm.

The majority of the eggs laid in captivity were fertile and eighty-eight larvae issued after an average incubation period of seven and one-half days.

The newly-hatched larva is pale yellowish-white and unarmed. Just previous to the first molt the general appearance is grayish, the integument being very transparent and smooth. The shape of the larva is cylindrical. Following the second molt the color is a yellowish-brown with a darker dorsal line, the internal tissues plainly visible through the integument. Each body segment bears a transverse row of short pale bristles. The full grown larva is 8.5 mm. in length and 2.3 mm. in maximum width; viscera plainly visible through the hyaline integument giving a general color of grayish-brown. Shape sub-cylindrical, slightly flattened dorsally, sides shallowly wrinkled and carinate, each segment armed with short pale spines; anterior spiracles light brown; posterior respiratory tubes brown, fused for their entire length, the combined width twice the individual length, each tube sub-cylindrical.

In the insectary ten larvae were raised on a diet of aphids, the species consumed being *Myzus rosarum* Walker, *Rhopalosiphum nervatum* Gillette, *Macrosiphum rosae* Linnaeus, and *M. granarium* Kirby.

These larvae transformed after a larval instar averaging thirty-three and one-half days, the experimental period running from March 20 to April 28. Nine of these subsequently issued as adult flies (five males, four females) after a pupal instar averaging sixteen days.

The mature flies were smaller than nearly all the specimens of *stegnum* that the writer has ever collected in the field, and this fact suggests that the larvae of this species are not normally aphidophagous, or that these larvae were not supplied with their normal host aphids. In California as far as the writer recollects the species of *Melanostoma* have always been abundant in spring, but on only one occasion has he taken a larva in the field. Therefore it would appear that either the larvae are not aphidophagous or that normally they feed at night. In the insectary at Alhambra the larvae did most but not all of their feeding at night, and were very sluggish in the daytime, being

adept at concealing themselves from the light. Their behaviour in this respect was very dissimilar to that of the larvae of other aphidophagous species, such as *Catabomba pyrastris* Linnaeus, *Syrphus nitens* Zetterstedt, and *Eupcodes volueris* Osten Sacken, under simultaneous observations. This fact suggests that normally *Melanostoma* larvae feed at night.

The puparium of *M. stegnum* is light brown in general appearance. The integument becomes slightly more opaque with age, but is never more than semi-transparent. The anterior end is moderately bulbous. In outline the dorsum descends posteriorly in an even arch and the center is hardly concave. Length, 6 mm., maximum height and width, 2 mm.

Allowing the female flies a pre-oviposition period of five days the life cycle of *M. stegnum* was completed in two months.

***Melanostoma chaetopoda* new species**

Two gravid females were collected in a field of peas infested with *Macrosiphum pisi* Kalt., on November 5, 1919, transported to the laboratory at Alhambra and placed in small wire screen cages enclosing pea plants infested with this aphid. The flies were fed diluted honey. Both died on November 7, each having deposited one egg. These eggs hatched in eight days, and the resultant larvae were placed in glass vials and offered aphids. One pupated on December 2 after a larval instar of twenty-six days, and the other was full grown on November 29 and remained alive without pupating until January 9, 1920. Both larvae were fed *Macrosiphum pisi*, and after November 23, when they cast the second molt, food records were kept. These showed that each of the larvae consumed nineteen aphids in the fourth instar. On January 2, 1920, a male fly emerged.

Between February 16 and April 4, 1920, seven females were collected in the field, transported to the insectary and placed in cages enclosing plants infested with aphids. Three deposited respectively four, six and three ova, the other four failing to oviposit and were possibly sterile. These females were fed with sugar water and lived in the cages from two to thirty days. Ten out of thirteen ova hatched after an average incubation stage of five and one-half days. On March 6 three larvae issued; from March 6 to 12 these were fed *Macrosiphum pisi*, from March

13 to 23 aphids on rose, from March 24 until pupation *Myzus rosarum* Walker. All three cast the second molt March 24 and thereafter the number of aphids (*Myzus rosarum* Walker, all instars) eaten was recorded. One larva consumed ninety aphids between March 24 and April 1, the date of its pupation; a second consumed two hundred and forty-seven between March 24 and April 4, when it pupated; the third died on April 1 after having eaten seventy aphids. Subsequently two male flies emerged after pupal stages of eighteen and twenty days respectively.

A female fly emerged April 22 after larval and pupal stages of seventeen and eighteen days respectively. This larva was raised on *Myzus rosarum* Walker and no incubation record was secured.

The egg and larval stages were shorter and the pupal stage longer than the corresponding stages of *M. stegnum* Say. The life cycle occupied about seven weeks in the insectary.

The egg is .9 mm. long by .24 mm. wide, chalk white; elevations of the chorion about twice as long as broad, in shape irregular. Eggs were deposited singly and not ranked.

The newly-hatched larva measures 1. mm. \times .24 mm., and is pale yellow with the integument unarmed. Prior to the second molt the color changes to and remains greenish-yellow and the integument is smooth. At the time of the second molt the larva measures about 4.8 mm. \times 1.4 mm. After this molt the color is light green with a dorso-median white stripe on the anterior two-thirds of the body. Towards the end of the instar the color becomes light brown with a pinkish suffusion. The posterior respiratory tubes are fused from the base almost to the apex; there is a slight constriction in the middle; the spiracular plates at the apices of the tubes are remote, brown, the spiracles straight narrow slits. The tubes are concolorous with the body color of the larva; each is slightly shorter than the combined basal width. The full grown larva is 10 mm. long, sub-cylindrical, very little flattened dorsally, transversely wrinkled and armed with few short pale hairs.

The puparium is 5.2 mm. long, 2.2 mm. wide, and 2.1 mm. in height. Color is light brown, the integument shows a black dorsal transverse bar at the anterior end, two black wavy lines

on the sides, a narrow black dorso-median stripe on the caudal half and many small black maculations all over. The anterior face of the puparium is bulbous, the dorsum evenly arched, the venter gently and shallowly concave. The body tapers laterally on the caudal half.

Melanostoma obscurum, variety **rostratum** Bigot (Pl. I. fig. E.)

Collections of adult females in the field, their transference to insectary cages containing plants infested with aphids, and observations on the habits of the forms were made as follows: On April 10, 1920, a female fly was placed in a cage containing a cabbage plant infested with the aphid *Aphis brassicae* Linnaeus. The following day eighteen ova were deposited on leaves and stem of the plant. Seventeen eggs were infertile, the single fertile egg hatching on April 19. On April 10 a second female was placed in a cage enclosing a horse bean plant infested with *Aphis rumicis* Linnaeus. The following day eighteen ova were deposited on the bean leaves. On April 17 fifteen eggs hatched. Both the flies died within two days of their capture. Between April 10 and 13 one male and six female flies were placed in a cage containing a pea plant lightly infested with the aphid *Macrosiphum pisi* Kalt. Thirty-three ova were obtained, and twenty-eight larvae hatched after an incubation period of four and five days. The last fly died eight days after its capture.

The egg measures .85 mm. in length by .36 mm. in width; elliptic oval, chalk white. The elevations of the chorion are irregular in shape and size, from six to two times as long as broad, the long axis parallel to that of the egg; they are connected by the usual fine ridges and occupy in the aggregate considerably more of the surface of the egg than the intervening sunken hyaline spaces do. The eggs were laid singly and not ranked.

The newly-hatched larva is cylindrical, smooth, and yellow in color.

Records of three larvae raised on an aphid diet in vials in the insectary at Alhambra, during the months of April and May 1920, indicated a larval stage of nineteen, twenty, twenty-three days. A fourth larva was full grown in thirty-one days after hatching from the egg but failed to pupate. Food records of these four larvae were made daily after the first molt, which in each case

occurred five days after hatching. One larva during its two final instars was supplied with rose aphids *Myzus rosarum* and *Rhopalosiphum nervatum* (instars iii and iv). It consumed a total of two hundred and seventy-eight aphids in fifteen days. A second supplied with the same aphids (instars iii, iv, v) consumed two hundred and eighty-two aphids in seventeen days. A third supplied with oak aphids *Myzocallis bellus* Walsh and *M. alhambra* Davidson (instars i to iv) consumed three hundred and forty-six aphids in thirteen days. The fourth larva which failed to pupate was supplied with similar aphids and consumed two hundred and nineteen in twenty-five days. Although the casting of the second molt was not observed, it appeared, from the rate of feeding of the larvae, that this skin was cast three or four days after the first molt had taken place. There is always a notable increase in the number of aphids eaten immediately following a molt of the syrphid larva. During the last three days of the larval stage few aphids were eaten.

After the first molt the larva is light green, on the medio-dorsum a white interrupted longitudinal stripe occurs. The cauda is truncate, the body inconspicuously armed with short pale hairs and wrinkled transversely. The dorsal stripe is doubly interrupted so as to leave a diamond-shaped whitish spot. Toward the end of the second instar the general color turns brown and the median stripe fades.

In the third instar the color is light brown. The whitish dorsal stripe is broken up to form a series of diamond-shaped spots. The vestiture is scanty and short.

The full grown larva is about 10 mm. long and 2 mm. wide. The ground color is light brown. On each side is a narrow longitudinal dull white stripe and down the medio-dorsum is an interrupted whitish stripe, the interruptions causing the formation of three diamond shaped spots. The body is transversely wrinkled and laterally carinate. The vestiture consists of scanty short pale hairs. The posterior respiratory tubes are light brown, fused except at their apices; each tube as broad at the base as it is long. The spiracular plates are remote, dark brown, each bearing three straight slit-like spiracles.

The puparium measures 5.8 mm. \times 2.7 mm. \times 2.4 mm., light brown in color, paler on dorsum and sides; dorsum arcuate, more

abruptly so on the anterior end, behind descending in an even curve to the cauda; venter gently concave; body narrowing caudad so that at the base of the posterior respiratory tubes its width is half that at the widest part-anterior third.

In May 1920 three individuals passed the pupal stage respectively in sixteen, sixteen, seventeen days.

The cycle, egg to adult, occupied about forty-two days for this species. This cycle is about as long as that of *M. chaetopoda* but shorter than that of *M. stegnum* Say.

The question as to whether the larvae of *Melanostomae* are normally entomophagous has been referred to above. Prof. C. L. Metcalf found that in Maine those of *Melanostoma mellinum* Linnaeus readily ate the aphids *Myzus persicae* Sulzer and *Aphis cornifoliae* Fitch, but refused several other species³. Mr. C. Howard Curran in a letter to the writer stated that in Ontario he found that the larvae of *M. obscurum* Say consumed both aphids and decomposing chickweed, and that they were more successful on the latter diet. In this connection it can be said that from the writer's observation the young larvae of the well-known aphidophagous syrphid *Allograpta obliqua* Say, are able to sustain themselves at least through the first few days of their larval life on plant food. In the cages at Alhambra there was no decomposing plant matter and the female *Melanostoma* flies deposited all their eggs on the plants, indicating some attraction to the aphids or to the healthy plants. While the individuals of *M. stegnum* raised on a diet of aphids became undersized imagines, those of the other two species became normal adults. It is possible that several of the species of *Melanostoma* are both phytophagous and entomophagous in the larval stage, and even that these are undergoing a transition in habit, changing from plant- to insect-feeders. The nocturnal habit of feeding and desire for concealment suggests that it may not have been so long ago that the larvae normally lived in obscurity inside plants, or in the open in darker situations than growing plants normally afford.

EXPLANATION OF PLATE I

Fig. D.—Eggs of *Melanostoma stegnum* Williston on bean leaf. Photograph taken at Alhambra, California, March 20, 1920.

Fig. E.—*Melanostoma obscurum* Say, var. *rostratum* Bigot. Full grown larvae. Photograph taken at Alhambra, California, April 27, 1920.

³ Me. Agr. Exp. Sta., Bull. 253, "Syrphidae of Maine."